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Building Resilience to Droughts: Scaling up Weather Insurance in China, India, and Thailand

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Introduction: Index-based insurance for drought risk reduction

Drought is a high-cost natural hazard that impacts on a large cross-section of poor, small, and marginal famers. It hits the agriculture sector the hardest, particularly in developing countries. In Asia and the Pacific region, almost 40% of the population are employed in agriculture, which contributes 7% to regional gross domestic product (GDP), approximately twice the global average (UNESCAP Statistical Yearbook 2013). Weather uncertainty is the root cause of drought risk. Drought risk reduction strategies, such as weather insurance, are gaining significance in the region as a way of transferring risk and protecting small farmers.

In traditional crop insurance schemes, the insured receives an indemnity from the insurer when crops are damaged by drought, hail, or frost. Such insurance exists largely because of subsidies provided by governments, which account for almost half of the premiums in some schemes (e.g., Federal Crop Insurance Corporation [FCIC] in USA, Fund for Natural Disasters [FONDEN] in Mexico, and Comprehensive Crop Insurance Scheme [CCIS] in India). However, high levels of subsidy are not sustainable and regional experiments in

Index-based weather insurance can help small farmers in the Asia Pacific region to manage drought risk. To upscale pilot schemes we need to invest in hydrometeorological networks (as well as crop-specific disaster loss databases, satellite-based products, and vegetation indexes) to ensure the availability of accurate and timely weather data and raise the awareness of farmers to improve the uptake of insurance products. Other recommendations for expanding Index-based weather insurance include reducing the basis risk; using risk-layered schemes; developing reinsurance markets; and targeting institutions as insurers instead of individual households.

Table 1: **China, India and Thailand's experiences with rainfall index insurance**

Country	Year	Policyholder	Institutions involved	Scale (number insured)	Tied to credit?
China	2008	Smallholder farmers	Guoyuan Agricultural Insurance Company, World Food Programme, International Fund for Agricultural Development	482	No
India	2003	Smallholder farmers	Agriculture Insurance Company	22,377,021	Yes
Thailand	2008	Smallholder farmers	Sompo Japan Nipponkoa Insurance Inc, Bank for Agriculture and Agricultural Co-operatives	2,800	Yes

Sources: IFAD 2010; Sinha et al 2014

promoting traditional weather insurance have not been successful. Index-based insurance can overcome some of the problems with traditional crop insurance schemes and has been piloted in several countries. Initial results of these pilots are encouraging where the uptake of insurance has been high. This case study looks at index-based weather insurance and highlights the learning from pilot schemes in China, India and Thailand for the purpose of scaling up.

China: Agriculture index insurance pilot in Anhui Province

In 2008, the World Food Programme (WFP), International Fund for Agricultural Development (IFAD), and Ministry of Agriculture of China issued a joint index insurance pilot scheme in Anhui Province, China. Anhui is one of the primary grain production provinces, with rice as the principal crop. The pilot index insurance covered around 500 households and 85 hectares of rice with a total insured value of USD 56,000 (IFAD 2010). Guoyuan Agricultural Insurance Company (GAIC), an insurance provider founded by 12 state-owned enterprises, was selected to be the principle insurance provider. The pilot covered heat waves (above 35°C) and droughts and was intended to cover potential losses in production costs. The premium was USD 2 per 0.07 hectares, and the premium rate was 4% of the sum insured. A total of 91.7% of the premium was subsidized, the same level as the national Multi-peril Crop Insurance (MPCI) (Balzer and Hess 2010). The pilot product was cheaper than MPCI, but covered fewer risks. The Institute of Environmental and Sustainable Development in Agriculture (IEDA), within the Chinese Academy of Agricultural Sciences (CAAS), was appointed to facilitate the provision of weather data from the Anhui Meteorological Service. In addition, several decades of rain gauge data were available (IFAD 2010).

Technical limitations: The pilot was limited by the availability of weather data. While China's weather data infrastructure is relatively well developed, there are not enough weather stations in the pilot area to provide accurate data efficiently. The pilot scheme relied on historical burn analysis to compensate for this lack of data, but there are numerous technical limitations involved with using historical data (IFAD 2010). Technologies such as remote sensing of rainfall and vegetation, rainfall modelling and simulation, seasonal forecasting, trends modelling, systematic communication tools, agricultural systems modelling, and water resource techniques are needed to help improve accuracy.

Operational and institutional limitations: A lack of awareness of the insurance product and a lack of trust in the insurance sector discouraged farmers from taking up the insurance (FERDI 2014). Moreover, the production cost of agriculture in China is generally very low, which meant that farmers were reluctant to incur an additional expense to protect their crops. Demand for index insurance was also limited by the availability of other crop insurance schemes, bank credit guarantees, and relief programmes. Furthermore, most insurers were not prepared to develop an index insurance product, despite their strong interest in the sector (IFAD 2010). More needs to be done to promote, incentivize, and build capacity in the index insurance industry to make it sustainable.

India: Weather Based Crop Insurance Scheme

In 2007, the Weather Based Crop Insurance Scheme (WBCIS) was introduced to provide weather index insurance (WII) products (AFC 2011), alongside the National Agricultural Insurance Scheme (NAIS). The scheme is run by the Agriculture Insurance Company of India (AIC).

WBCIS aims to provide protection to farmers against adverse weather events, including insufficient rainfall, by basing insurance payouts, not on damage, but on a given weather index. Currently, yield index and WII are the dominant insurance types. The insurance is linked to credit and farmers can get insurance through obtaining credit. The average premium is 8% depending on the crop type and region insured (Ministry of Agriculture). The subsidy ranges from 25–80% depending on the crop; the average subsidy is 63% of the premium (IFAD 2010). Weather index data are generally taken from commercial weather stations approved by the insurance issuers, the four main ones being: India Meteorological Department (IMD), Weather Risk Management Services (WRMS), National Collateral Management Services Limited (NCMSL), and India Space Research Organization (ISRO). Crop growth simulation models were developed to capture the correlation between yield and weather indices. Feasible trigger and payout rates were developed using these models to make the insurance products sustainable and attractive to farmers.

Private WII is also available in India through two main insurance providers among others: ICICI Lombard and Indian Farmers Fertiliser Cooperative (IFFCO) Tokio General Insurance Company (ITGI). Their products have been distributed through multiple channels, including rural corporative banks, input suppliers, and contract farming companies. BASIX, a micro-insurance provider, also started selling insurance products in 2008 at a 40–50% subsidy, after the government announced that it will start

to offer private insurance companies the same subsidies as public companies in certain regions. Its customers are mostly smallholder farmers for whom formal credit channels are not easily affordable.

Technical limitations: The index insurance product of WBCIS is limited by the location of weather stations. The Agricultural Finance Corporation, in its report on the effectiveness of WBCIS (AFC 2011) found that 77% of farmers were not satisfied with the location of weather stations. This is reasonable as the basis risk, the difference between the actual amount of insurance compensation and the farmers' actual loss, is largely influenced by the location of weather stations. The lack of weather data and real-time data transfer were also reported to be significant challenges to the accuracy and efficiency of the settling amount. In many regions, the provision of daily data was not guaranteed and this made it difficult to design a more accurate model of crop growth and to decide a proper threshold level for payouts. In order to acquire accurate data and minimize basis risk, it is estimated that India would need an additional 10,000 weather stations, which is a significant financial commitment (IFAD 2010). To address this issue, better product design suited to the climate characteristics and nature of crops in the area needs to be implemented (Rao 2014).

Operational and institutional constraints: Developments in private sector index insurance are adversely affected by current policies related to public sector index products. Banks in India are obligated to offer publicly-subsidized NAIS traditional insurance products, which limits their willingness to invest in index insurance. Moreover, there is generally a lack of knowledge in India about insurance schemes. To address this issue, it is recommended that institutions introduce capacity building targeting farmers (Rao 2014). Reinsurance (the insurance of the insurer) should also be strengthened. The reinsurance sector has been limited in India, and, although reinsurance rates have generally been very high, it is only available for premium values over USD 1 million (Sinha et al. 2014). This is an issue particularly for private WII providers such as BASIX, which focus on micro-insurance products.

Thailand: Weather Index Insurance in northeastern Thailand

The WII programme for rice crops was piloted in Khon Kaen Province in northeastern Thailand in 2008 (Jeerachaipaisarn 2009). The programme aims to protect insured farmers against droughts, which are common phenomena in northeastern Thailand. The province has 34 weather stations covering approximately 10,000 km^2 (Sinha 2014), which is a relatively high density. As of 2013, WII has been formally commercialized as an insurance option for farm loans, is available in 9 provinces, and has insured more than 2,800 farmers (Sinha 2014).

Weather index insurance is based on a rainfall index designed by Sompo Japan Nipponkoa Insurance Inc (Sompo), which uses historical data of accumulated rainfall from weather stations. Based on surveys, Sompo set three different thresholds for payouts, depending on the timing and severity of the droughts: early drought, drought, and severe drought. The payouts occur in two different periods. If the rainfall in July is below the threshold of an early drought, the farmer receives 10% of the loan principle and then the policy contract is terminated; if the rainfall in July remains above that threshold, the policy contract remains active; and if the rainfall in August and September is below the threshold of drought or severe drought, then the payouts are of 15% and 40% respectively (see http://www.sjnk.co.th/view_news.asp?id=29).

Weather index insurance is the result of an international partnership between the Japanese insurance company, Sompo, which designed the WII product, and BAAC, which provides Sompo with local information and acts as a distribution channel. The public institution, Japan Bank for International Cooperation (JBIC), initiated the business relationship between Sompo and BAAC and facilitated communications with the relevant Thai institutions, such as the Thai Meteorological Department, which provided historical rainfall data and set up the necessary weather stations. Japan's National Institute for Agro-Environmental Science (NIAES) also provided technical support. Hence, various private-public partnerships (PPPs) played critical roles in developing WII, setting an encouraging precedent.

Technical constraints: In northeastern Thailand, there is a lack of irrigation infrastructure and crop yields are highly correlated to annual rainfall. This makes WII particularly well suited to northeastern Thailand. However, access to data remains a major challenge for the growth of this weather index based insurance. WII requires an extended period of historical weather data from meteorological stations close by in order to improve the design of products to reflect actual damage and losses according to weather conditions. In this regard, satellite weather data can be used to complement weather data, but investment is needed in technologies such as weather monitoring ground

infrastructure and satellite imagery capabilities to closely monitor rainfall, rainfall patterns, and the effect of spatial variation in rainfall on crop yield.

Operational and institutional constraints: The WII scheme has had mixed success so far. Although the partnership of Sompo and BAAC and their communication with Thai farmers have allowed WII to be tailored to suit the needs of clients, it has had relatively low penetration rates. One of the reasons is the lack of awareness among farmers of WII. Also, loan insurance is not compulsory in Thailand and WII is only offered as an option when taking a bank loan, thus most farmers consider it an additional cost.

Lessons learned

Globally, weather insurance is continuously evolving. While weather index-based insurance has been adopted worldwide, a number of pilot projects are ongoing using a combination of satellite technology and weather index. China, India, and Thailand are at different phases of adopting WII with varying levels of support from their respective governments. Early experiences with WII provide some good insights into its effectiveness and sustainability as a drought management tool. While weather insurance has demonstrated the potential to help farmers protect their investments against recurrent droughts, key issues remain to be addressed:

- **Invest in technological innovations:** Accurate and timely weather data hold the key to successful index insurance products. The densification of hydrometeorological networks in drought-prone areas and the development of crop-specific disaster loss databases, satellite-based products, and vegetation indexes are examples of some of the technological innovations needed to operationalise weather insurance.
- **Raise the awareness of farmers:** In all of the cases studied, low awareness among farmers about the potential benefits of weather index based insurance products and their relatively low premiums was an obstacle. Proper marketing and awareness raising campaigns should accompany any future introduction of index-based insurance.
- **Reduce the basis risk:** To deepen the market for index-based insurance, the basis risk must be reduced. Increasing the correlation of the index with actual yields will contribute to the development of the market.
- **Use risk-layered schemes:** A risk-layer approach would protect farmers from the widest range of events ranked by severity (reduction of 10%, 20% up to 100% of the yields, based on an historical average, for example). Layered programmes involve a series of insurers writing coverage, each one in excess of the lower limit written by other. Governments should heavily subsidize the insurance of the highest risk layer, while the lower ones would be dealt with by the private sector. Such a scheme would reassure farmers, while at the same time guaranteeing a certain market size for insurance companies, thus allowing them to expand their range of index-based products.
- **Develop reinsurance markets:** Risk-layering schemes can also come with the use of reinsurance schemes. Reinsurance was available in the cases studied, but with limited scope. Scaling up and the development of the reinsurance market is also essential to encourage the involvement of private insurance companies and to effectively transfer risk from domestic to international insurance markets.
- **Target institution level insurance:** Targeting institutions instead of individual households might also expand the use of index-based insurance. Institutions such as cooperatives operating on mutualised fixed costs, banks with outstanding loans, and international organizations committed to providing aid in times of crisis (e.g., the Global Facility for Disaster Reduction and Recovery, Oxfam, etc.) have an interest in subscribing to index-based insurance in order to insure their portfolios at risk. Once payment is triggered, these institutions can use their knowledge of the field to fine tune payments to the victims based on observable losses and lessening the basis risk, thus improving the overall quality of the index-based insurance product.

References

AFC (2011) *Report on impact evaluation of pilot weather based crop insurance study (WBCIS)*. Mumbai: Agricultural Finance Corporation Ltd

Attri, SD; Tyagi, A (2010) *Climate profile of India*. India Meteorological Department

Balzer, N; Hess, U (2010) *Climate change and weather risk management: Evidence from Index-based Insurance Schemes in China and Ethiopia*. United Nations World Food Programme

Carter, M; de Janvry, A; Sadoulet, E; Sarris, A (2014) *Index-based weather insurance for developing countries: A review of evidence and a set of propositions for scaling- up*. Background document for the workshop 'Microfinance products for weather risk management in developing countries: State of the art and perspectives', 25 June 2014, Paris

Chen, YT (2011) *Weather index-based rice insurance: A pilot study of nine villages in Zhejiang Province, China*. ETH Zurich

FERDI (2014) *Index-based weather insurance for developing countries: A review of evidence and a set of propositions for up-scaling*. Fondation pour les Études et Recherches sur le Développement International

Giné, X; Townsend, R; Vickery, J (2008) *Patterns of rainfall insurance participation in rural India*. International Bank for Reconstruction and Development

Giné, X; Menand, L; Townsend, R; Vickery, J (2012) *Microinsurance: A case study of the Indian rainfall index insurance market*. World Bank

Gommes, R; Kayitakire, F (2010) *The challenges of index-based insurance for food security in developing countries*. European Commission Joint Research Center

IFAD; WFP (2010) *The potential for scale and sustainability in weather index insurance*. Rome: International Fund for Agricultural Development and the World Food Programme

Jeerachaipaisarn, T (2012) *Recent developments of crop insurance in Thailand*

Liu, BC; Li, MS; Guo, Y; Shan K (2010) 'Analysis of the demand for weather index agricultural insurance on household level in Anhui, China.' *Agriculture and Agricultural Science Procedia* I: 179–186

Miranda, MJ; Farrin, K (2012) 'Index insurance for developing countries.' *Applied Economic Perspectives and Policy* 34 (3): 391–427

Rao, KN (2014) *Innovative crop insurance programme*. Report of Indira Gandhi Institute of Development Studies and International Flood Policy Research Institute, 30 July 2014.

Sinha, S; Tripathi, NK (2014) 'Assessment of crop insurance international practices, policies and technologies as risk mitigation tools in India and Thailand.' *International Journal of Advanced Research* 2 Issue 9: 769–789

Sompo Japan Nipponkoa Insurance (Thailand) Plc. Website http://www.sjnk.co.th/view_news.asp?id=29 [accessed 29 January 2015]

Sun, ZY; Zhang, JQ; Zhang, Q; Hu, Y; Yan, D (2014) 'Integrated risk zoning of drought and waterlogging disasters based on fuzzy comprehensive evaluation in Anhui Province, China.' *Natural Hazards* 71: 1639–1657

Zant, W (2007) 'Hot stuff: Index insurance for Indian smallholder pepper growers.' *World Development* 36: 1585–606

Zhang, QF; Kobayashi, Y; Alipalo, MH; Zheng, Y (2011) *Drying up: What to do about droughts in the People's Republic of China*. Asian Development Bank

UNESCAP (2013) *UNESCAP statistical yearbook for Asia and the Pacific 2013*. Bangkok: Economic and Social Commission for Asia and the Pacific. Available at http://www.unescap.org/stat/data/syb2013/ (accessed 24 March 2015)

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